

TM 9-1829A

WAR DEPARTMENT TECHNICAL MANUAL

ORDNANCE MAINTENANCE

SPEEDOMETERS, TACHOMETERS,
AND RECORDERS

WAR DEPARTMENT

APRIL 1944

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G. C. MARSHALL,
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OFFICIAL:

J. A. ULIO,
Major General,
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I C 9: T O & E 9-327, Ord Base Auto Maint Co (Engine Rebuild)
or Co, Ord Base Auto Maint Bn.

(For explanation of symbols, see FM 21-6.)

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**ORDNANCE MAINTENANCE
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CHAPTER 1

INTRODUCTION

1. PURPOSE AND SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the repair and rebuilding of speedometers, tachometers, recorders, and related drive equipment. These instructions are supplementary to those in the field manuals and technical manuals prepared for the using arms. This manual does not contain information which is intended primarily for the using arms, since such information is available to ordnance maintenance personnel in 100-series TM's or FM's.

b. This manual contains a description of, and procedure for testing, disassembly, cleaning, inspection, and assembly of all makes of speedometers, tachometers, recorders (including hourmeters), flexible shafts, and drive joints.

c. For instructions for removal and replacement of instruments, etc., on vehicles, refer to pertinent operator's manual 100-series TM's.

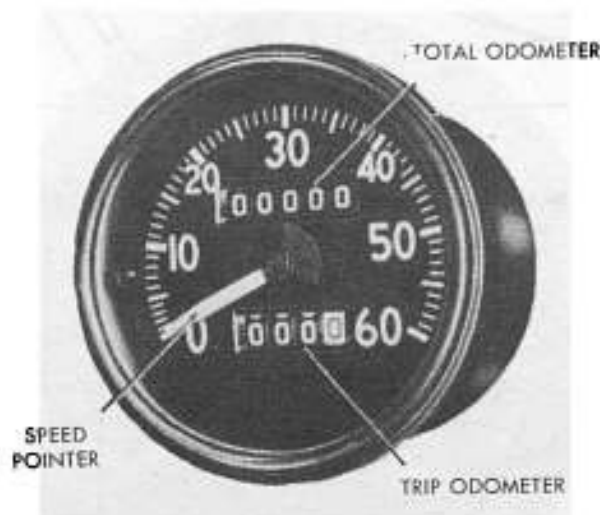
CHAPTER 2

MAGNETIC-TYPE SPEEDOMETERS AND TACHOMETERS; DESCRIPTION, OPERATION, IDENTIFICATION, AND TESTING

2. DESCRIPTION AND OPERATION.

a. **Description.** All makes of magnetic-type speedometers and tachometers are similar in outward appearance, having a case, bezel, glass, pointer, and face dial. (Where the bezel and glass are assembled in the instrument panel, these parts are not attached to the speedometer itself.)

(1) **SPEEDOMETER.** A speedometer (fig. 1) is used to indicate vehicle speed in miles per hour as shown by the pointer and face dial, and to record distance traveled by means of an odometer. A



RA PD 318886

Figure 1—Speedometer

speedometer is driven through a flexible shaft connected to a set of gears in the vehicle transmission (fig. 2). These gears are designed for the particular vehicle model and take into consideration the tire size and rear axle ratio. The flexible shaft, which connects the transmission driven gear to the speedometer, consists of an outer casing and the inner drive core (fig. 3). The total odometer usually records up to 99,999 miles before it automatically returns to zero. The trip odometer usually registers up to 999.9 miles, but by means of the trip reset it can be reset to zero or any intermediate figure desired. Some speedometers are not equipped with a trip odometer. These units have an extra wheel or tenth dial at the right of the total odometer.

(2) **TACHOMETER.** A magnetic-type tachometer (fig. 4) is similar to a speedometer, except that the face dial indicates in revolutions per minute (instead of miles per hour) and is ordinarily used to indicate vehicle engine speed. A tachometer is driven through a flex-

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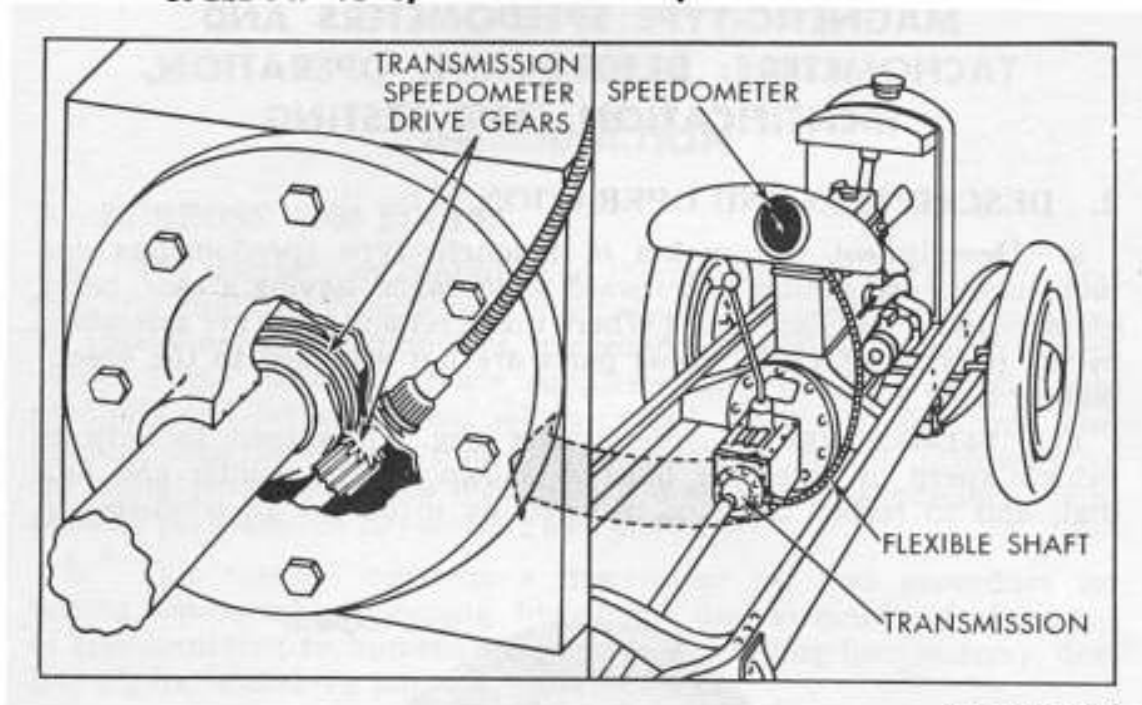


Figure 2—Speedometer Installation

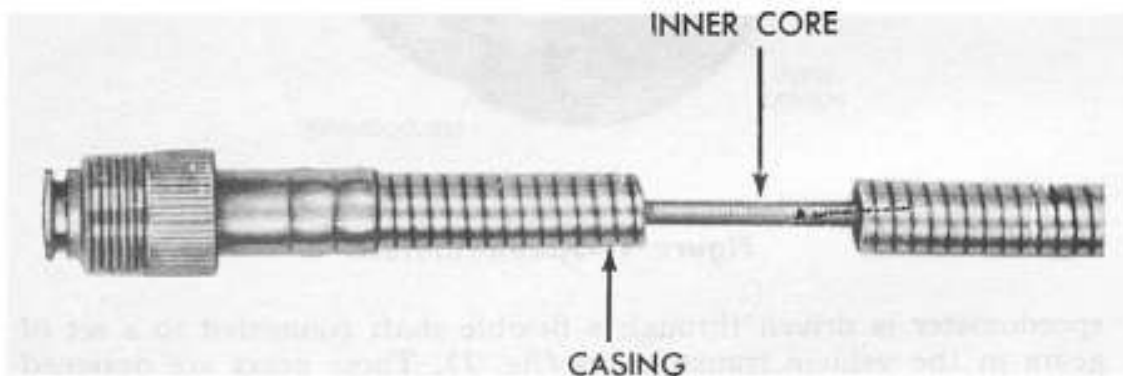


Figure 3—Flexible Shaft

ible shaft which is usually connected to the vehicle generator shaft, crankshaft, or distributor shaft by means of a drive joint or adapter. An odometer is often incorporated in a tachometer to record total revolutions.

b. Operation. Even though the internal parts of the various make magnetic-type instruments vary in construction and appearance, they

MAGNETIC-TYPE SPEEDOMETERS AND TACHOMETERS; DESCRIPTION, OPERATION, IDENTIFICATION, AND TESTING

all incorporate the same basic components (as described below) and operate on the same principles.

(1) **SPEED INDICATION** (fig. 5). The speed-indicating portion of a speedometer or tachometer of the magnetic-type operates on the magnetic principle, and includes a revolving permanent magnet (driven by the flexible shaft). Around this revolving permanent magnet is a stationary field plate. (Some Auto-Lite instruments have a revolving field plate). Between the magnet and field plate is a movable speed cup, with the indicating pointer attached to the end of the speed cup staff. The magnet revolves within the speed cup. The revolving magnet sets up a rotating magnetic field which exerts a pull or magnetic drag on the speed cup, making it revolve in the same direction. The movement of the speed cup is retarded and held steady

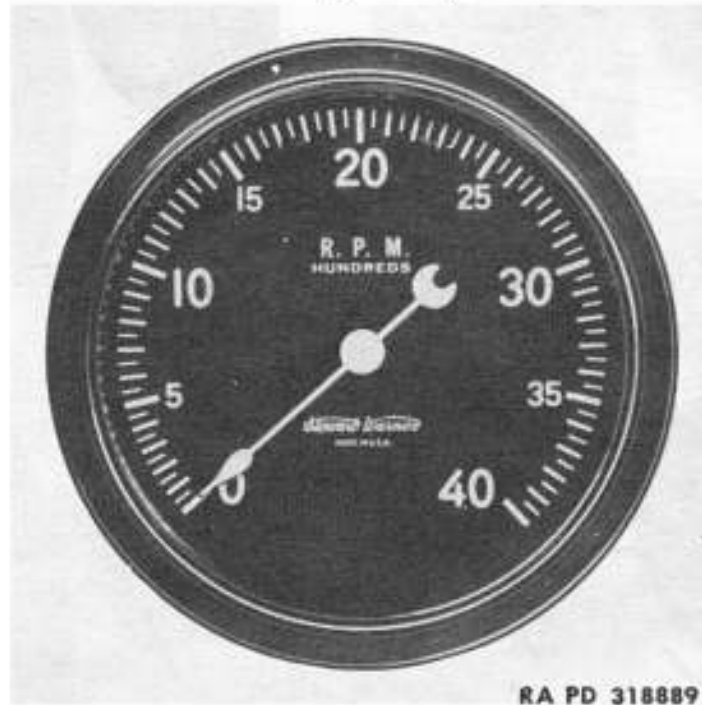


Figure 4—Tachometer

by a hair spring attached to the speed cup staff. The speed cup comes to rest at a point where the magnetic drag is just balanced by the retarding force created by the hair spring. An additional function of the hair spring is to pull the pointer back to zero when the vehicle or engine stops. There is no mechanical connection between the revolving magnet and the speed cup. As the speed of the magnet increases due to vehicle acceleration or (as in the case of a tachometer) increase in the engine speed, the magnetic drag on the speed cup also increases and pulls the speed cup further around, thus registering a faster speed by the pointer and face dial. The magnetic field is constant, and the amount of speed cup deflection is at all times proportionate to the speed at which the magnet is being revolved.

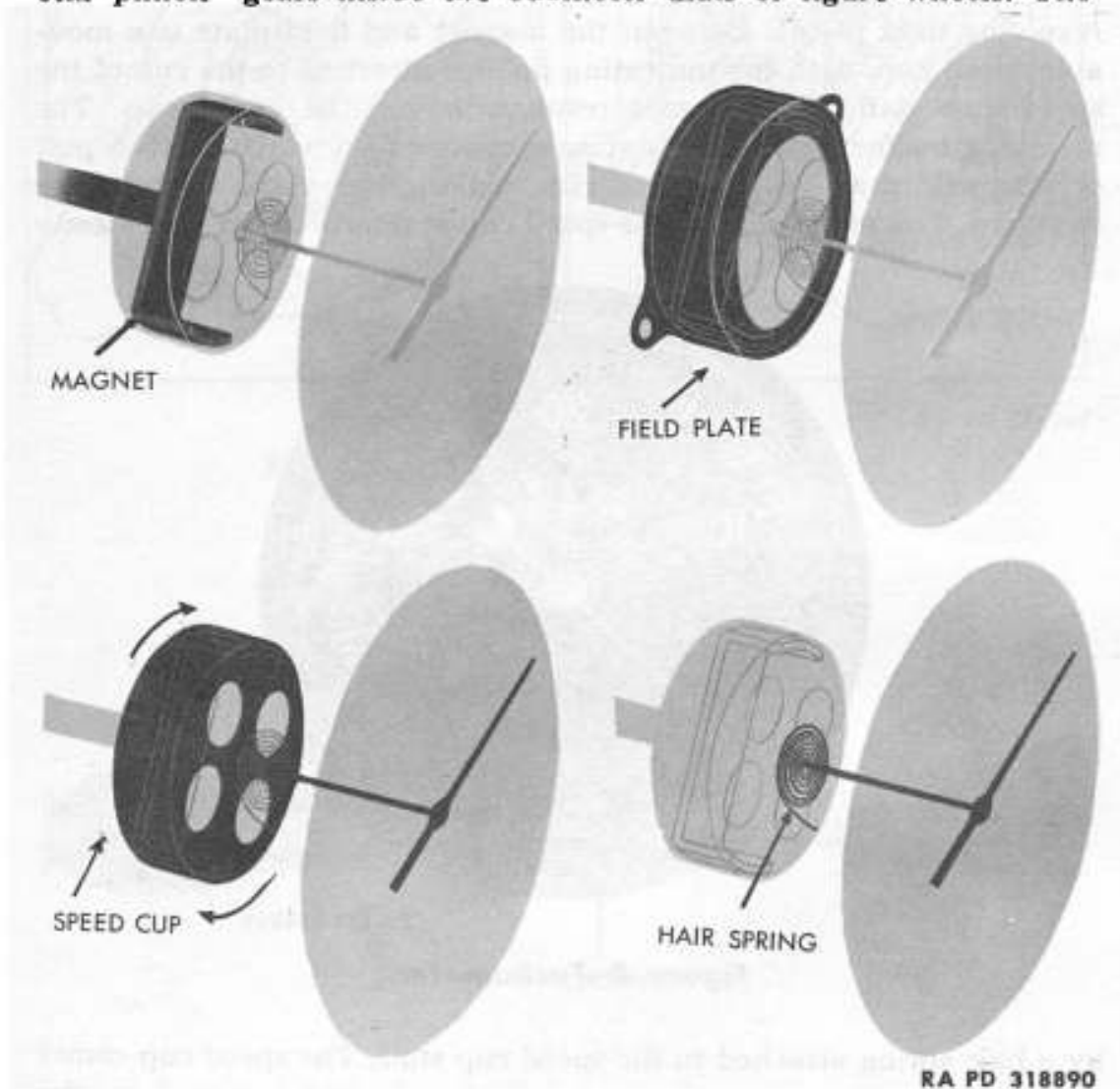
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(2) ODOMETER OPERATION.

(a) *Total Odometer* (fig. 7). The total odometer is driven through a series of gears originating at a spiral gear cut on the magnet shaft. This gear, known as the "first gear," drives an intermediate "second gear" and "third gear" which is connected to a "fourth gear" at the odometer. The "fourth gear" turns the odometer through a series of "star pinion" gears inside the odometer dials or figure wheels. The



RA PD 318890

Figure 5—Phantom View of Basic Components of Speed-Indicating Portion of Speedometer

total odometer usually has five figure wheels or dials, and is so constructed and geared that as any one wheel finishes a complete revolution it turns the next figure wheel to the left $\frac{1}{10}$ of a revolution.

(b) *Trip Odometer* (fig. 8). The trip odometer is also driven by the "third gear," through the trip odometer drive gear, and another gear at the trip odometer. The trip odometer usually has four figure wheels, and is so constructed that as any one figure wheel finishes a